

# Assessment Of Nerve Conduction Parameters Of Peroneal Nerve In Patients With Lumbosacral Radiculopathy - A Cross-Sectional Study In A Tertiary Care Centre Of North-East India

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## Abstract:

**Background:** Lumbosacral Radiculopathy is a term used to describe a pain syndrome occurring secondary to mechanical and/or inflammatory cycles compromising the nerve roots. Nerve conduction studies (NCS) are electrodiagnostic tests used to evaluate peripheral nerve function and assess the neuromuscular complaints. The study was conducted to assess the motor nerve conduction of Peroneal nerve in patients with Lumbosacral radiculopathy.

**Objectives:** To assess the nerve conduction parameters of Peroneal nerve in patients with Lumbosacral radiculopathy.

**Materials and Method:** A hospital based cross-sectional study was carried out among one hundred and sixty-four (164) Lumbosacral Radiculopathy patients attending Neurology OPD of AGMC & GBPH Hospital. Following standard protocol NCS was conducted after obtaining informed consent from the participants. Data were recorded in a predesigned case study format and analysed using SPSS 21. A p-value of <0.05 was considered statistically significant.

**Results:** Among one hundred and sixty-four (164) study participants 45% of them were female and 55% of them were male. 55% of the participant had decreased conduction velocity of Right peroneal nerve. 65% of the participant had decreased conduction velocity of Left peroneal nerve. Mean Right and left peroneal conduction velocity was (42.82 ±7.50) m/s and (42.01±10.52) m/s respectively. Mean right and left peroneal F wave latency was (43.18±10.52) ms and (43.18±12.21) ms respectively.

**Conclusion:** NCV can be a valuable tool to evaluate the patients of lumbosacral radiculopathy.

**Keywords:** Lumbosacral radiculopathy, Nerve conduction study, conduction velocity, F wave.

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Date of Submission: 25-02-2025

Date of Acceptance: 05-03-2025

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## I. Introduction

Radiculopathy is a term used to describe a pain syndrome occurring secondary to mechanical and/or inflammatory cycles compromising the nerve roots. One of the differentials for low back pain is lumbosacral radiculopathy with a lifetime prevalence of 60% to 90%.<sup>1</sup> Numbness, tingling sensation, weakness and radiating pain which typically present unilaterally are the most common symptoms of radiculopathy.<sup>2</sup> A wide range of 2-40% of the cases of lumbosacral radiculopathy is caused by Discopathies and lumbosacral disc herniation. The most common levels affected are L5-S1 and L4-5.<sup>3</sup>

NCS can be a useful diagnostic tool in cases of radiculopathy when combined with a thorough history and clinical examination. It is a noninvasive, objective, and reproducible tool to assess the functional integrity of the nerve root. Patients with lumbosacral radiculopathy may present with sensory symptoms or motor symptoms or with mixed symptoms involving both motor and sensory component. In cases of sensory symptoms as the affected nerve is proximal to the dorsal root ganglia, sensory nerve conduction study is usually normal.<sup>4</sup>

Motor nerve conduction studies of the common peroneal nerve can be useful to assess the patient lumbosacral radiculopathy. Late responses (F-wave and H-reflex) usually provide information about the proximal nerve segment.<sup>5</sup>

Very few studies have been conducted to evaluate the use of nerve conduction studies in the diagnosis and assessment of patients with lumbosacral radiculopathy. There is a need for more studies to be conducted to correlate the findings of the NCS in patients with lumbosacral radiculopathy. Especially in Northeastern part of India, no such studies have been conducted in patients with lumbosacral radiculopathy. Therefore, this study is taken up to assess the nerve conduction in patients with lumbosacral radiculopathy.

## **II. Aims & Objectives**

To assess the nerve conduction parameters of peroneal nerve in patients with Lumbosacral radiculopathy.

## **III. Materials And Method**

**Study type:** Observational study

**Study design:** Hospital based Cross- sectional study

**Study duration:** January 2024 to November 2024

**Study area / location:** Department of Physiology in collaboration with Department of Neurology, Agartala Govt. Medical College (AGMC).

**Study population:** One hundred and sixty-four (164) adult patients between the age group of 30 to 70 years with Lumbosacral Radiculopathy attending Neurology OPD of AGMC & GBP Hospital.

### **Inclusion criteria for cases:**

1. Age group of 30-70 years
2. Lumbosacral Radiculopathy: (AAPT Criteria)<sup>6</sup>
  - a. Pain radiating from Lumbar region to the leg in one or more dermatomal distributions of the Lumbosacral Nerve routes.
  - b. Pain on most days for atleast 3 months and atleast half of the days in past 6 months.
  - c. Presence of Neurological Signs (Sensory deficit, Weakness, reflex changes) or symptoms (eg. Paresthesia) in the anatomical distribution of the painful route territory.
  - d. Exclusion of Non – Spinal causes of radicular pain (eg. Diabetic Neuropathy)
3. Co-operative & willing to participate in the study.

### **Exclusion criteria for cases:**

1. Patients with electrolyte imbalance
2. Patients with Diabetes Mellitus, Thyroid disease
3. History of prior spinal surgery

**Sampling procedure:** Convenient sampling

All the lumbar radiculopathy patients attending neurology clinic who will fulfill the inclusion and exclusion criteria during the study period of study were included.

### **Study tools:**

- Stadiometer: Bioplus; height -200cm
- Weight Machine (Mechanical EQ-BR -9201): Brand- Equinox, Weight Limit- 130kg
- 2/4 Channel portable RMS EMG.NCV.EP machine
- Case study format

### **Study procedure:**

All the study subjects were selected consecutively during the study period following the inclusion and exclusion criteria. The data were collected from the Lumbosacral radiculopathy patients attending Neurology OPD of AGMC & GBP Hospital, Agartala two days a week within one and half year period.

All the participants were personally subjected to detailed history regarding name, age, sex, occupation, socioeconomic status, educational status, medical history and clinical features etc. These findings were recorded in a predesigned and pretested standard questionnaire. Blood sugar level, thyroid level and other laboratory findings were recorded from previous and current medical documents. Written informed consent was obtained from all the participants. Complete general physical and systemic examination was performed.

1. **Age:** Was recorded from birthdays to the nearest completed years.
2. **Standing height:** Height of the subjects was measured barefooted in centimeters to the nearest 0.1 cm.

3. **Weight:** Weight of the subject was recorded to the nearest 0.1kg.
4. **NCS:** The nerve conduction recordings were performed using RMS EMG.NCV.EP machine. The subjects were allowed to lie down on a couch and relax fully to ensure good recordings. The area of the skin was cleaned thoroughly with spirit to remove dirt, dead cells and grease. The cup or disc electrodes (Ag-AgCl) of 1 cm diameter filled with conducting jelly was fixed on the skin of recording area with transpore tape. These electrodes were connected to the oscilloscope through the preamplifier. After 10 min of rest and adaptation to the laboratory environment, electrodiagnostic tests were performed following the standard procedures. The recordings were performed with standard equipment settings of sensitivity 5 mV/division, sweep speed 5 ms/division, stimulus duration 0.2 ms, low frequency filter 10 Hz, high frequency filter 5 KHz by using supramaximal strength of stimuli. Motor NCS was performed for Peroneal nerve. The recording electrode, the reference electrode and the ground electrode were attached. The cathode of the stimulating electrode was placed proximal to the recording electrode. The nerve was stimulated to record the muscle action potential and the following parameters were measured: Standardized distal latency in ms, amplitude of compound muscle action potential in mV (CMAP), nerve conduction velocity in m/s and F wave latencies in ms.

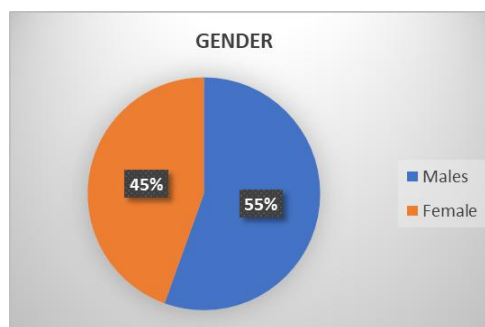
**Data analysis:** Data were analyzed using SPSS 20. Descriptive statistics and other suitable statistical tests were used as per applicability. Data were expressed in terms of mean and standard deviation. Correlation was assessed between BMI and Nerve conduction parameters. A probability value less than 0.05 were considered as significant.

#### IV. Results

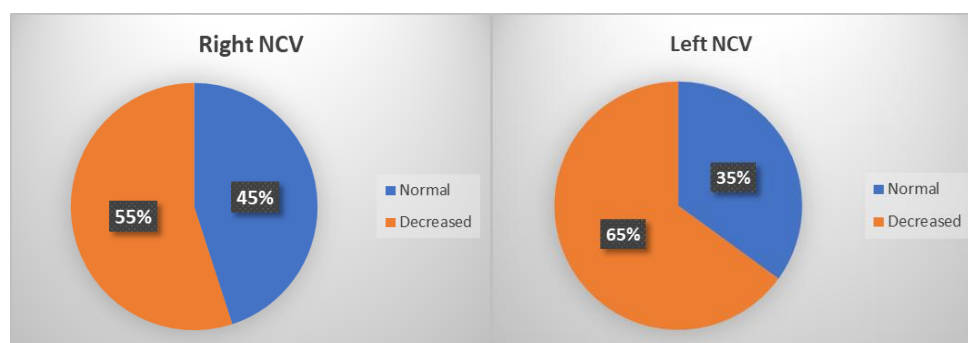
One hundred and sixty-four (164) Lumbosacral Radiculopathy patients participated in the study. Demographic variables of the study participants are described in Table 1. 45% of them were female and 55% of them were male as shown in Figure 1. 55% of the participant had decreased conduction velocity of Right peroneal nerve and 45% of the participant had decreased conduction velocity of Left peroneal nerve as shown in Figure 2. Mean Right and left peroneal conduction velocity was  $(42.82 \pm 7.50)$  m/s and  $(42.01 \pm 10.52)$  m/s respectively. Mean right and left peroneal F wave latency was  $(43.18 \pm 10.52)$  m/s and  $(43.18 \pm 12.21)$  m/s respectively.

Variables	Mean	±Std. Deviation
Age (Years)	49.57	±11.78
Height (cm)	153.67	±5.45
Weight (kg)	58.48	±8.99

**Table 1: Demographic variables of the participants**



**Fig.1: Gender distribution among study participants**



**Fig.2: Conduction velocity among study participants**

NCS Parameters		Mean	±Std. Deviation
Right Peroneal	Latency (ms)	3.31	±0.93
	Amplitude (mv)	5.04	±2.41
	Conduction velocity (m/s)	42.82	±7.50
Left Peroneal	Latency (ms)	3.17	±0.87
	Amplitude (mv)	4.51	±2.37
	Conduction velocity (m/s)	42.01	±8.09
F-wave	Right Peroneal latency (ms)	43.18	±10.52
	Left Peroneal latency (ms)	43.18	±12.21

**Table 2: Mean and Std. deviation of NCS Parameters**

### V. Discussion

The study was conducted among one hundred and sixty-four (164) lumbosacral radiculopathy patients between the age group of 30 to 70 years. Motor Latency and Amplitude were within normal limits. F-wave Latency were within normal limits. Nerve conduction velocity of both right and left peroneal nerve is 45% and 55% decreased accordingly suggest axonal demyelination.

Various studies have been taken to correlate the nerve conduction study with Lumbosacral radiculopathy patients. In our study 45% and 55% were having abnormal motor nerve conduction velocity among 164 subjects which is highly significant than Ghugrae et al, in that 68% subjects having abnormal MNC among 50 study participants. And they concluded NCS plays an important role in patients of Lumbosacral radiculopathy.<sup>7</sup>

In another study they showed differences between sides in F waves of patients with unilateral Lumbosacral Radiculopathy. They found differences between sides in minimum and mean latencies and the most significant difference was the higher percentage of repeater waves detected in the affected side compared with the normal side in both the peroneal and tibial nerves which is not significant with our study.<sup>8</sup>

Yousif S et al, conducted a cross-sectional analytical study in patients with lumbosacral radiculopathy caused by lumbar intervertebral disc herniation in that study, there is no significant difference was found in the motor nerve conduction study parameters (latency, amplitude, and conduction velocity) between the patient's group and the control group. There was a significant prolongation in late responses (H-reflex and F-wave). They concluded-reflex latency prolongation being the commonest encountered abnormality and also they concluded that normal physical examination was frequently encountered with abnormal NCS as well as abnormal physical examination detected in patients with normal NCS findings. Therefore, both of them should be evaluated simultaneously in patients with history suggesting radiculopathy.<sup>5</sup>

Nisargandha MA et al conducted a study and found gross impairment of conduction velocities and the degree of demyelination and axonal loss in the examined sciatic nerve. They concluded that NCV will be helpful for the early detection of demyelination and also for detection of nerve injuries in the patient of sciatica.<sup>9</sup>

Power S et al conducted a study to evaluate diagnostic utility of various motor and sensory nerve conduction study parameters in cervical radiculopathy patients. CMAP was found to be more sensitive with high positive predicative value. Sensory nerve conduction parameters were found to have less sensitivity but higher specificity as compared to motor parameters.<sup>10</sup>

Talinga AA et al conducted one study to identify changes in nerve conduction parameters in Lumbar radiculopathy. And they concluded NCS plays an important role in establishing the functional diagnosis of primary nerve damage.<sup>11</sup>

Lumbosacral radiculopathy is a term used to describe the syndrome complex caused by compression or irritation of nerve roots in the lower back. It can be caused by lumbar disc herniation, degeneration of the spinal vertebra, and narrowing of the foramen from which the nerves exit the spinal canal.<sup>12</sup>

### VI. Conclusion

Motor nerve conduction parameters show significant changes in lumbosacral radiculopathy. NCS can be valuable tool to evaluate the radiculopathy patients.

### Acknowledgement

We are thankful to all the study participants for participating in the study. We also want to thank Medical Research Unit of AGMC & GBPH for supporting the study.

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